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Time Trends

Changes that occurred in cancer incidence and cancer mortality in Michigan over a ten to fifteen-year period are illustrated in this section. Data on new cancer cases from 1988 to 2002 and deaths due to cancer from 1989 to 2003 were made available from the statewide cancer registry at the Michigan Department of Community Health.[1] The Estimated Annual Percent Change (EAPC) in age-adjusted incidence and mortality rates over multiple-year periods were calculated by regressing the calendar year on the natural log of age-adjusted incidence and mortality rates.[2,3] Rates were calculated by direct age-adjustment using the 2000 US population age distribution as the standard population.[4] In the regression equation ($y=mx+b$), x=year and y=ln(rate). The $EAPC=100*((e^{m})-1)$. To test EAPC for statistical significance, t tests were used to test the hypothesis that the slope of the regression line is equal to zero, using two-sided p=.05. The EAPC in mortality rates was calculated over the period 1994 to 2003 and EAPC in incidence rates was calculated over the period 1993 to 2002.

The EAPC in mortality and incidence rates for Michigan and the United States over the period 1992 to 2002 are presented for comparison.[5]

Summary

Figures 1 through 3 show the EAPC in mortality rates for the total population, and for women and men for the relevant cancer sites. From 1994 to 2003, Michigan total mortality rates due to breast, cervical, colorectal, lung and prostate cancer all decreased. All changes were statistically significant at $p \leq .05$. Lung cancer mortality rates decreased among men, but increased among women (statistically significant changes at $p \leq .05$).

Figure 4 shows EAPC in mortality rates for Michigan next to EAPC in mortality rates for the United States. Over the time period from 1992 to 2002, both Michigan and the United States had similar EAPC for breast, colorectal, lung and prostate cancer rates. The greatest difference between Michigan's and the national EAPC in mortality rates was for cervical cancer mortality; Michigan's EAPC was –4.4%, compared to the national EAPC of –3.1%.

Figures 5 through 7 track yearly mortality rates for each cancer site from 1989 to 2003. The mortality rates followed over time are presented for the total population and by gender.

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[1] Michigan Resident Cancer Incidence File including cases processed by November 16, 2004 and Michigan Resident Death Files, Michigan Department of Community Health (MDCH), Division for Vital Records and Health Statistics.
[2] Annual state population estimates based on the actual size of the Michigan population in years 1985 through 2003 were used in calculating rates. Population data provided by the Department of Management and Budget, received February 15, 2005.
[3] Edwards BK, Brown ML, Wingo PA, Howe HL, Ward I, Ries LAG, Schrag D, Jamison PM, Jemal A, Wu XC, Friedman C, Harlan L, Warren J, Anderson RN, Pickle LW. Annual Report to the Nation on the Status of Cancer, 1975-2002, Featuring Population-Based Trends in Cancer Treatment. Journal of the National Cancer Institute. October 5, 2005; 97:19, 1407-27.
[4] Michigan Department of Community Health (MDCH), Division for Vital Records and Health Statistics.
[5] Ries LAG, Eisner MP, Kosary CL, Hankey BF, Miller BA, Clegg L, Mariotto A, Feuer EJ, Edwards BK (eds). *SEER Cancer Statistics Review, 1975-2002*, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2002/, based on November 2004 SEER data submission, posted to the SEER web site 2005.

Figures 8 through 10 show the EAPC in incidence rates for the total population, women only and men only for the relevant cancer sites. In the period from 1993 to 2002, cervical, colorectal, lung and prostate cancer incidence rates in Michigan all decreased; the decrease in the rates for cervical, colorectal, and lung cancer sites were statistically significant at $p \leq .05$. Lung cancer incidence among men decreased, while the incidence rate among women increased by 0.4% per year; changes in EAPC among males were statistically significant at $p \leq .05$.

Figure 11 shows EAPC in incidence rates for Michigan and EAPC in incidence rates for the United States. From 1992 to 2002, the greatest difference in EAPC was in cervical cancer incidence and Michigan's EAPC was more negative than the EAPC for the United States. The EAPC in colorectal, lung and prostate cancer incidence rates were similar in Michigan and nationally. For breast cancer incidence; Michigan's EAPC showed a slight decrease, while nationally the EAPC was 0.4% (although neither EAPC was statistically significant).

Figures 12 through 14 follow the yearly incidence rates by cancer site from 1988 to 2002 for the total population, and women and men separately.

Figure 1.

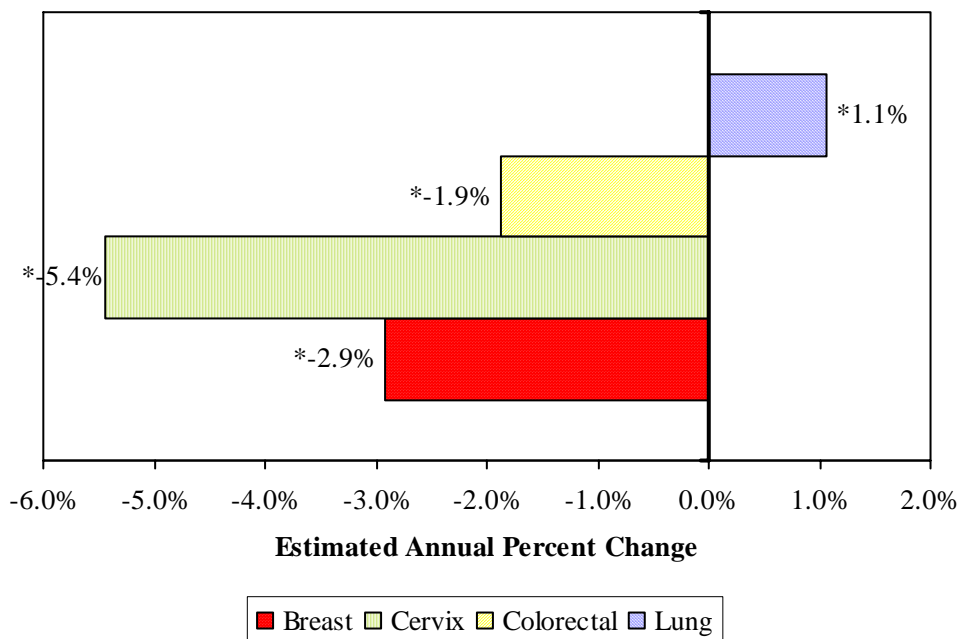# Estimated Annual Percent Change in Mortality Rates by Cancer Site, Michigan 1994-2003
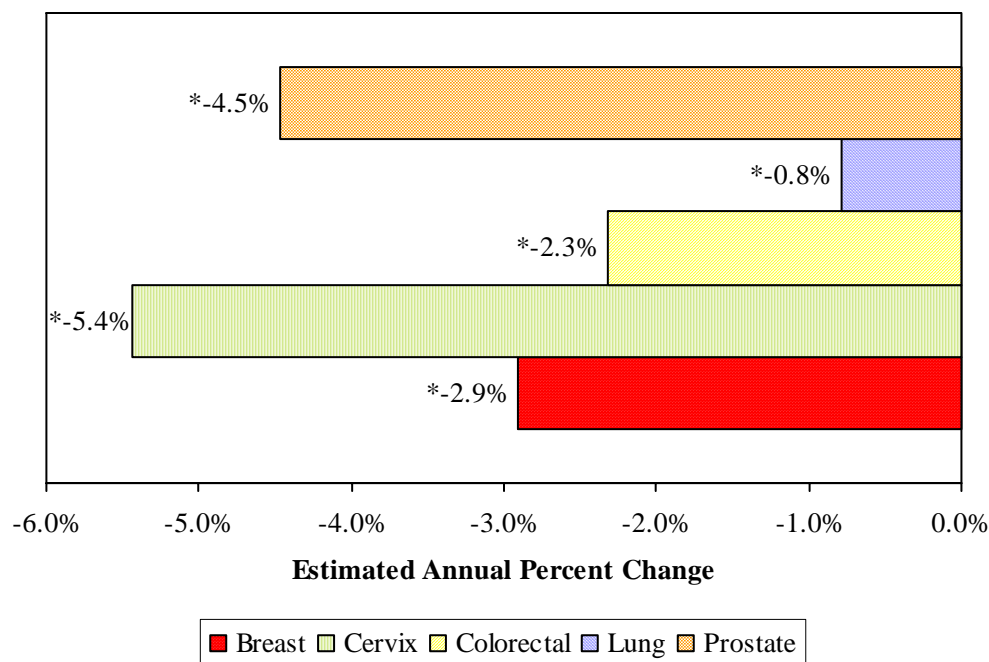
Estimated Annual Percent Change

Breast ☐ Cervix ☐ Colorectal ☐ Lung ☐ Prostate

* The EAPC is significantly different from zero (p≤.05).
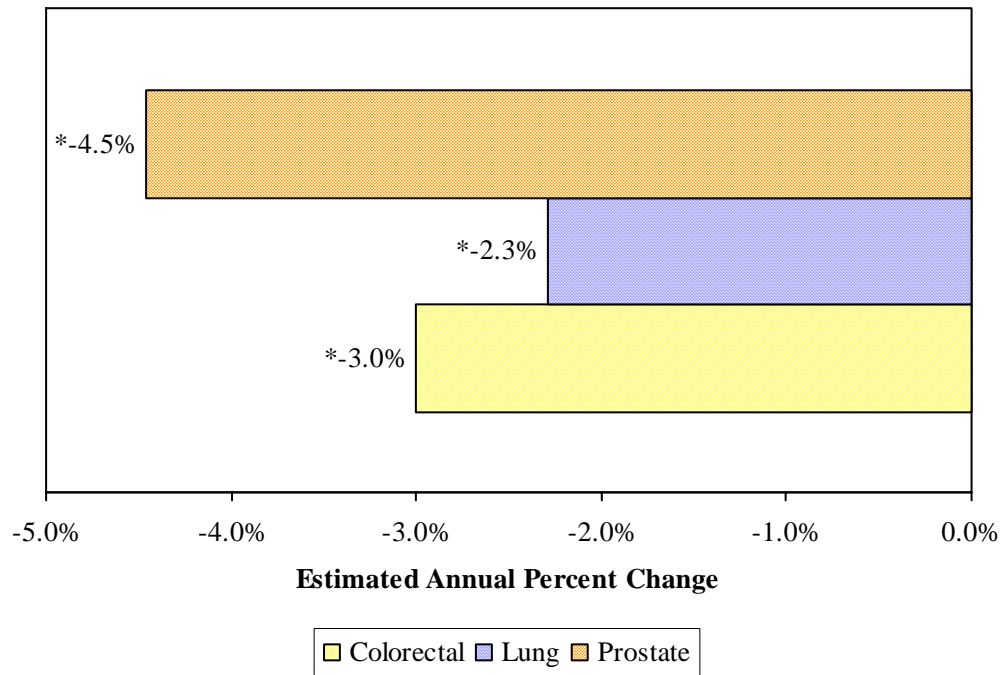Rates are age-adjusted and computed by gender for breast, cervical and prostate cancer.

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Figure 2.

Estimated Annual Percent Change in Mortality Rates by Cancer Site, Michigan Females 1994-2003

Estimated Annual Percent Change

Breast ◼ Cervix ◻ Colorectal ◻ Lung ◼

* The EAPC is significantly different from zero (p≤.05).
Rates are age-adjusted and computed by gender.

Figure 3.

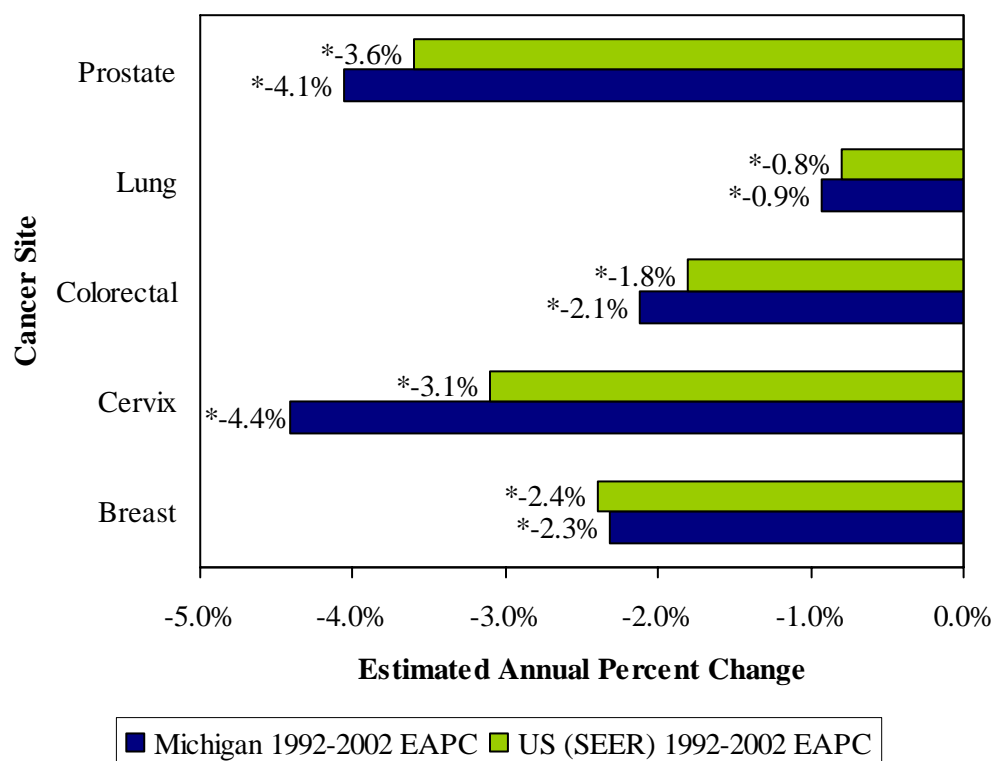# Estimated Annual Percent Change in Mortality Rates by Cancer Site, Michigan Males 1994-2003

Estimated Annual Percent Change

☐ Colorectal ☐ Lung ☐ Prostate

* The EAPC is significantly different from zero (p≤.05).
Rates are age-adjusted and computed by gender.

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<u>Figure 4.</u>

Estimated Annual Percent Change
in Mortality Rates,
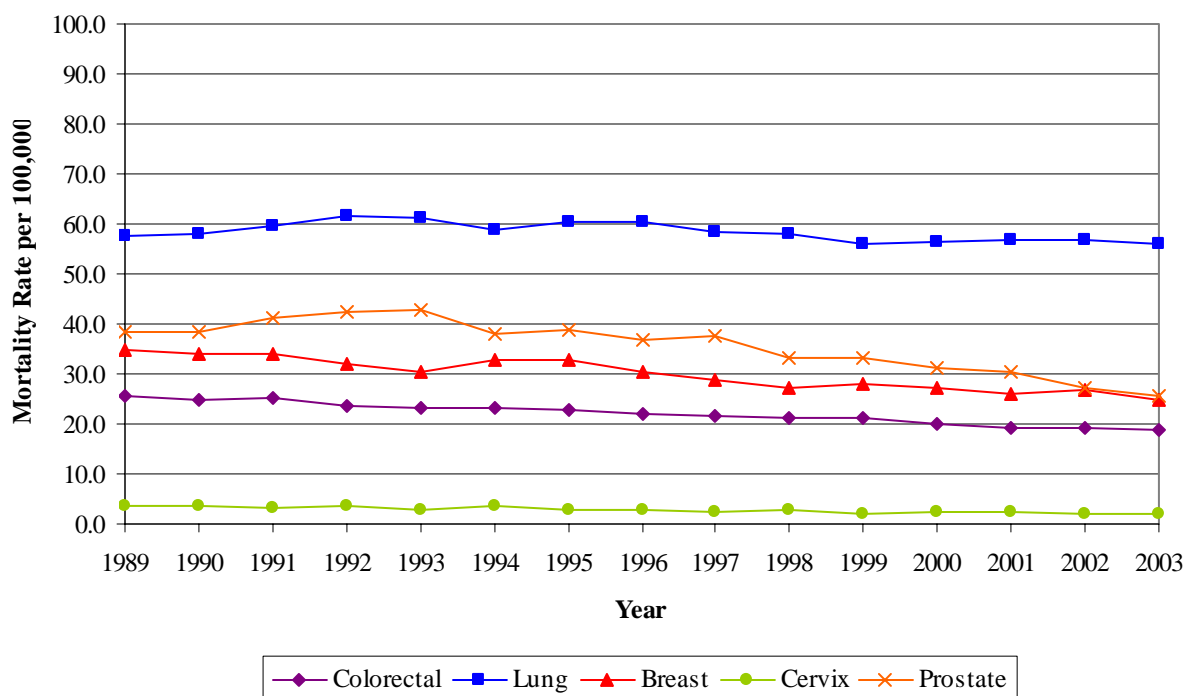# Michigan vs. US 1992-2002

Estimated Annual Percent Change

* The EAPC is significantly different from zero (p≤.05).
Rates are age-adjusted and computed by gender breast, cervical and prostate cancer.
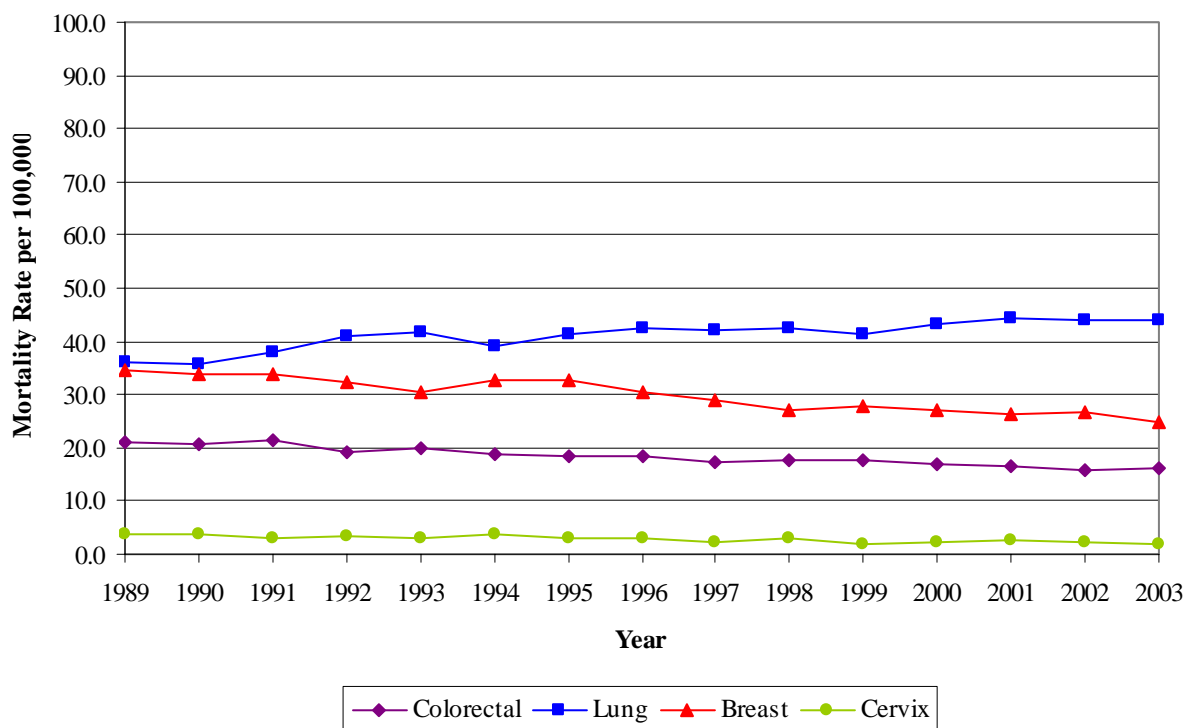
Figure 5.

Total Mortality Rates by Cancer Site, Michigan 1989-2003

Rates are age-adjusted per 100,000 population and computed by gender for breast, cervical and prostate cancer.
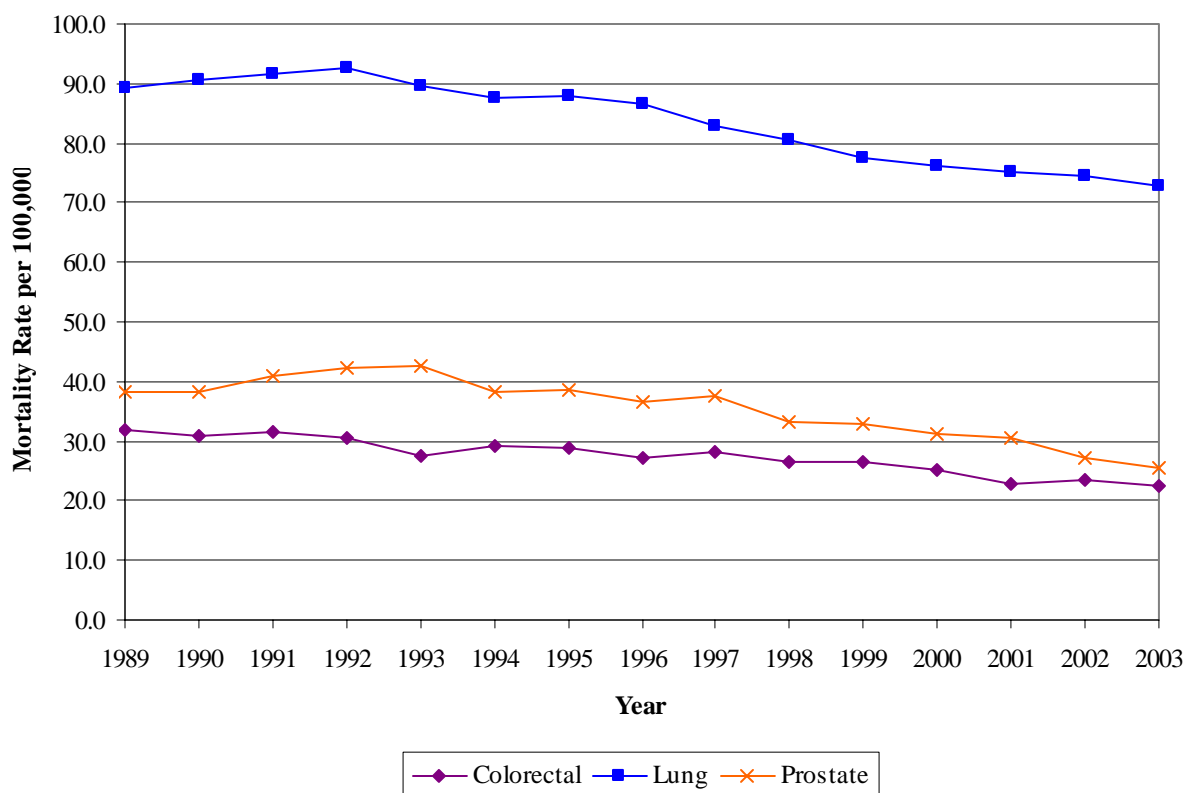
Figure 6.

Female Mortality Rates by Cancer Site,
Michigan 1989-2003

Rates are age-adjusted per 100,000 gender-specific population.
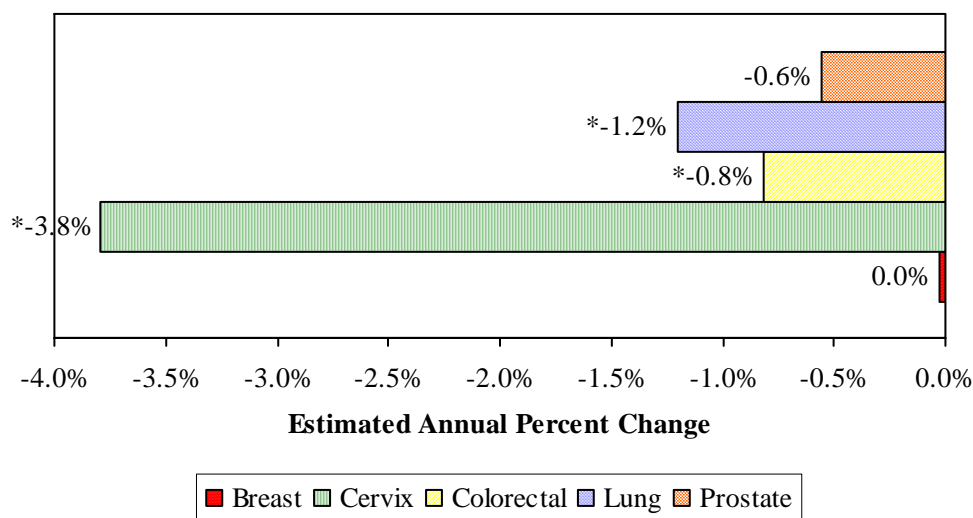
Figure 7.

Male Mortality Rates by Cancer Site, Michigan 1989-2003

Rates are age-adjusted per 100,000 gender-specific population.

Figure 8.

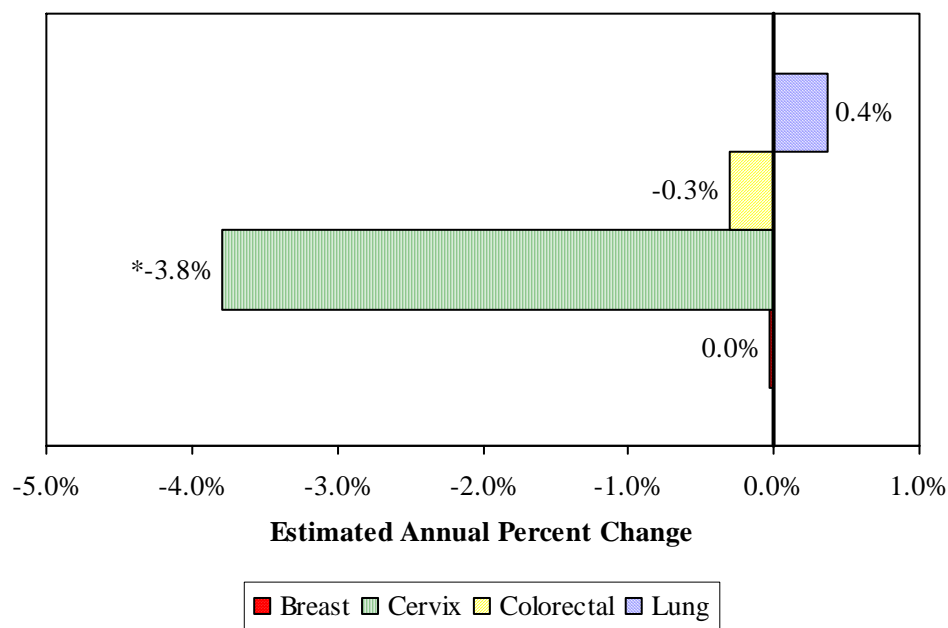# Estimated Annual Percent Change in Incidence Rates by Cancer Site, Michigan 1993-2002

-0.6%
*-1.2%
*-0.8%
*-3.8%
0.0%

Estimated Annual Percent Change

■ Breast ▨ Cervix ▢ Colorectal ▨ Lung ▨ Prostate

* The EAPC is significantly different from zero (p≤.05).
Rates are age-adjusted and computed by gender for breast, cervical and prostate cancer.

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Figure 9.

Estimated Annual Percent Change in Incidence Rates by Cancer Site, Michigan Females 1993-2002

Estimated Annual Percent Change

■ Breast ▦ Cervix ▢ Colorectal ▨ Lung

* The EAPC is significantly different from zero (p≤.05).
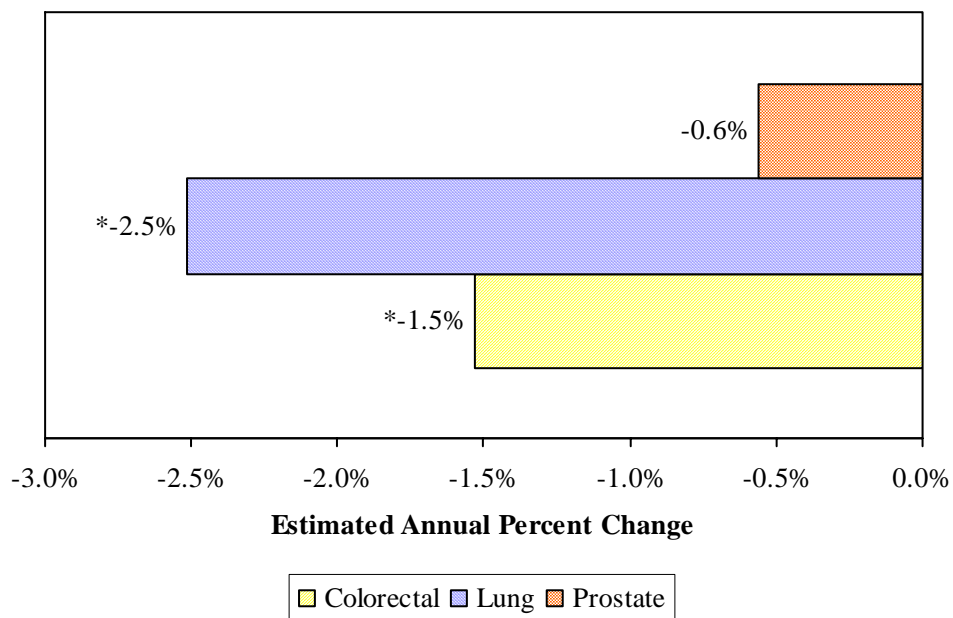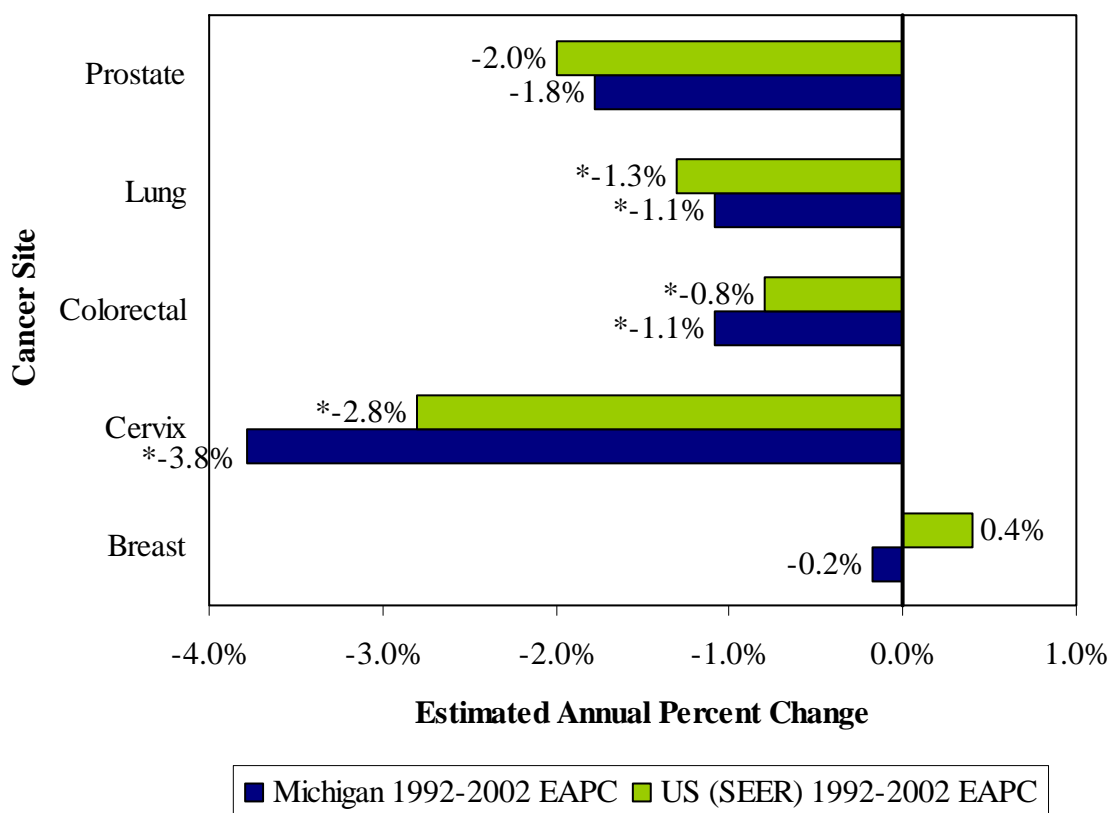Rates are age-adjusted and computed by gender.

Figure 10.

Estimated Annual Percent Change in Incidence Rates by Cancer Site, Michigan Males 1993-2002

* The EAPC is significantly different from zero (p≤.05).
Rates are age-adjusted and computed by gender.

Figure 11.

Estimated Annual Percent Change in Incidence Rates, Michigan vs. US 1992-2002

Estimated Annual Percent Change

■ Michigan 1992-2002 EAPC ■ US (SEER) 1992-2002 EAPC

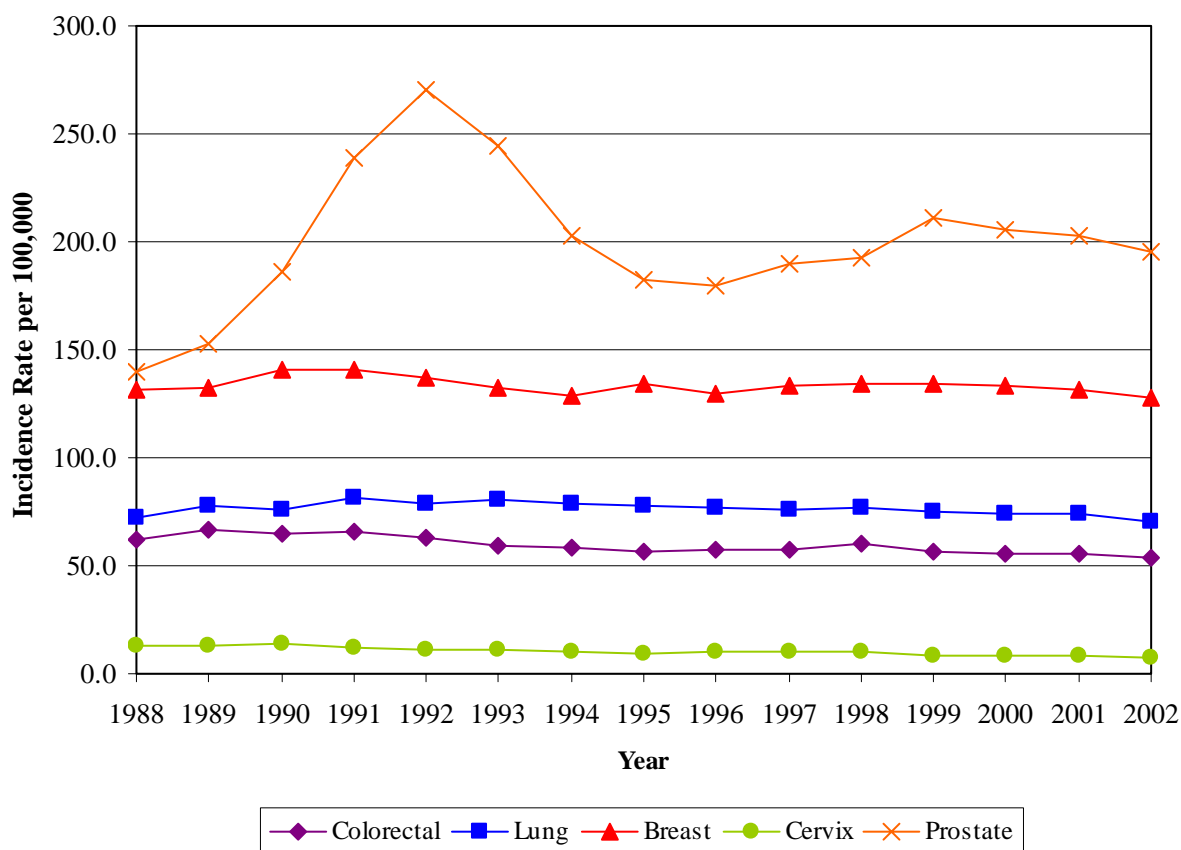***** The EAPC is significantly different from zero (p≤.05).
Rates are age-adjusted and computed by gender for breast, cervical and prostate cancer.
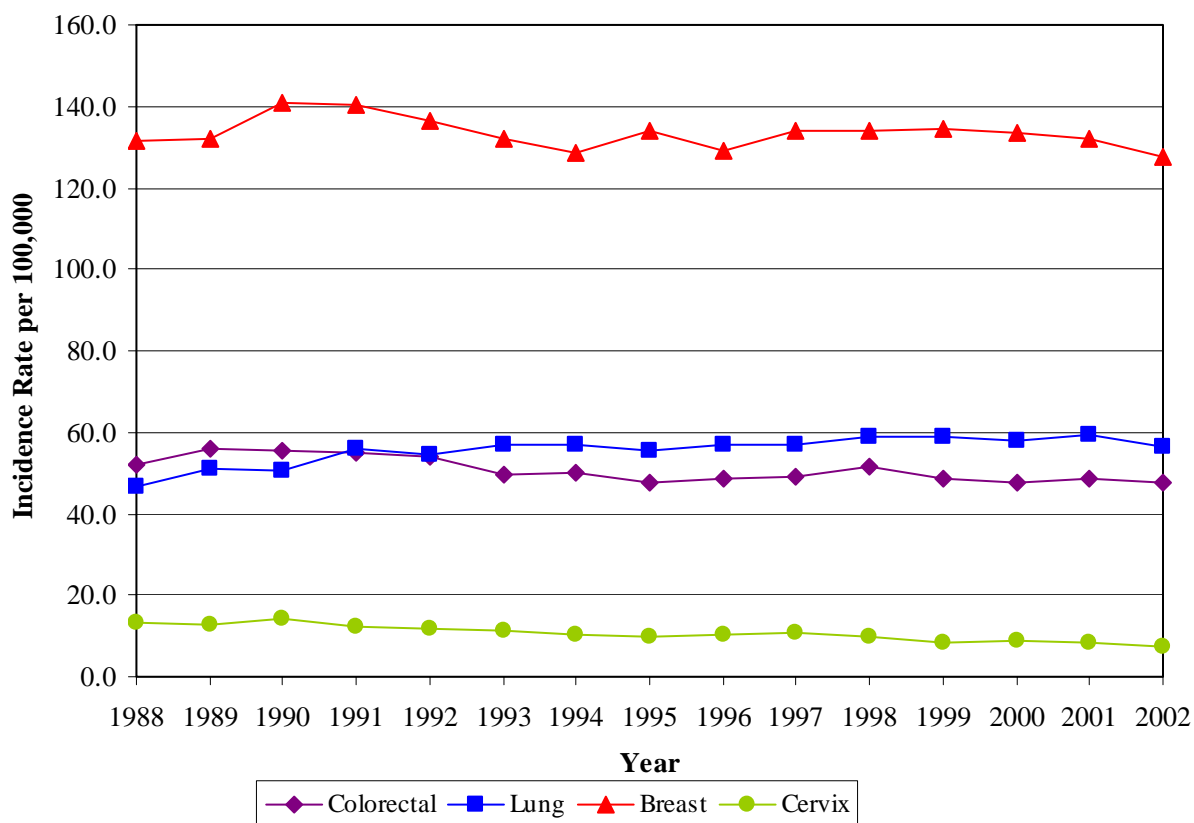
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Figure 12.

Total Incidence Rates by Cancer Site, Michigan 1988-2002

Rates are age-adjusted per 100,000 population and computed by gender for breast, cervical and prostate cancer.
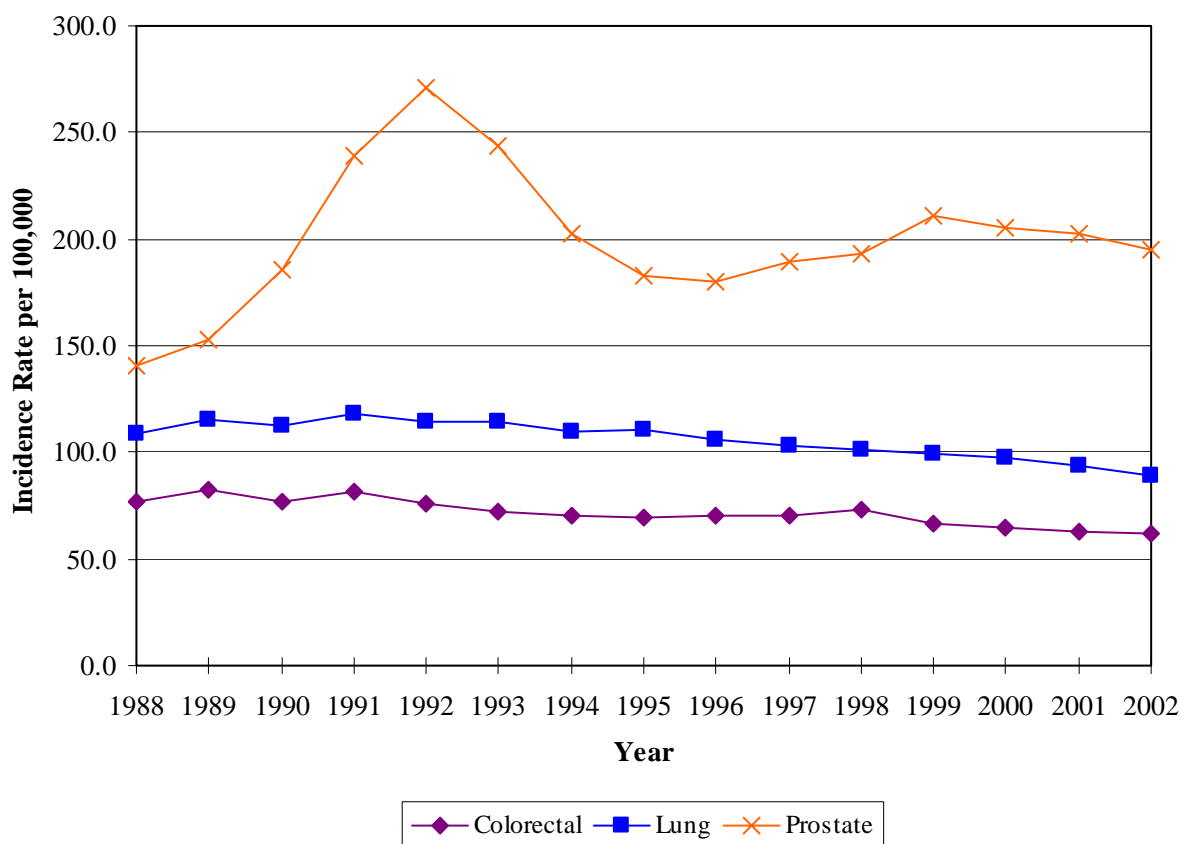
Figure 13.

Female Incidence Rates by Cancer Site, Michigan 1988-2002

Rates are age-adjusted per 100,000 gender-specific population.

Figure 14.

Male Incidence Rates by Cancer Site, Michigan 1988-2002

Rates are age-adjusted per 100,000 gender-specific population.